Association of Transportation Safety Information Professionals

2002 Traffic Records Best Practice
Application Form

Part 1 - Project Summary

PROJECT TITLE:__Iowa's "SAFER", SAFety (data) Exploration Resource: an Information System for the Five E's of Highway Safety

(Enforcement, Engineering, Education, Emergency Response, and Everybody Else.)

APPLICATION ORGANIZATION:

Lead Agency: Iowa Dept. of Transportation

Nominating Person: Joyce Emery

Title: Program Manager

Project Manager: Michael Pawlovich

Agency: Iowa Dept. of Transportation.

Office: Office of Traffic and Safety

Address: 800 Lincoln Way

City, State, ZIP Ames, Iowa 50010

Telephone: 515-239-1016 (Joyce)
515-239-1428 (Michael)

FAX: 515-239-1891

Email: Michael.pawlovich@dot.state.ia.us
Joyce.emery@dot.state.ia.us

Identify to which national agenda goal(s) this applies:

Goals II, IV, and VI:

The wording of the relevant Iowa goal is similar to Goal II: "To insure data availability to users."

Rationale: If all members of the highway safety community have access to safety data in formats useful to them, they are more likely to use good information in their safety work. Better decisions will be made, and more lives will be saved.

This project is offered as one model for achieving this goal using GIS technology.

The component of SAFER that is the focal point of this submittal is called GIS-SAFER. This is an analysis tool that has been customized (using Avenue Scripts) for use within the general highway safety community, including members of TraCS local agencies.

The features we suggest as Best Practices include:

1. SAFER is designed with SMS (five E's) approach in defining who the users are. GIS-SAFER therefore can be used with TraCS local datasets by local enforcement officials.

2. SAFER retains the statewide scope of its predecessors, including all public road systems, all reportable crashes, and, for local databases, all records the local agencies wish to keep in their database, whether or not they meet definitions for state level databases.

3. From data collection to data usage, the SAFER system begins and ends as a unified GIS technology.

4. SAFER has subsystems designed to meet needs of different user groups. GIS-SAFER is one of the key subsystems. Others would be ERIS and CMAT (explained elsewhere).

5. GIS-SAFER is designed for expansion to include other types of safety data, and already can utilize roadway data.

6. GIS-SAFER is designed for easy modification (such as for a revised report form or for use by another state)

Was this item to be addressed according to your traffic records committee's strategic plan? If yes, which item.

The first strategic plan of the Statewide Traffic Records Advisory Committee, completed in 1995, recommended to the responsible DOT offices that the current program of crash data availability be modernized and that more timely data be provided. The three sections of the strategic plan all relate to the topic of this submittal: 1) improving the location methodology; 2) integrating data systems; and 3) empowering local safety professionals to perform their own analyses.

The DOT responded by organizing a quality improvement team to review the existing system, PC-ALAS. By mid-1996, this team had identified seven key processes within the system: 1) data inputs from Office of Driver Services; 2) analysis software development and maintenance; 3) customer service policies; 4) staffing and other resources; 5) methods of distributing and updating the system; 6) user training; and 7) marketing. For each of these processes the team determined current capabilities, needs and challenges, and opportunities for improvement.

Both the STRAC strategic plan and the DOT internal quality team called for investigation into the use of Geographic Information Systems as the future way of doing business. Also in 1996, focus groups were held around Iowa for the purpose of learning what local professionals thought should be done with state safety funds. Independent of the other two groups, they requested the same thing. As a result, the first contract to begin the transition to GIS was initiated in January 1997.

It has taken five years for the transition, including conversion of data collection to a statewide coordinate system and conversion of data analysis to GIS-based tools available to all. The Location Tool is a part of TraCS (Traffic and Criminal System) while at the analysis end, the new GIS-based system is SAFER (SAFety Exploration Resource).

PROJECT COST:

Planned: $ Expectation was to spend about $300,000 over a three to four year period.

Actual: $ Between $300,000 and $400,000 over five years.

(exclusive of the Location Tool for capturing location and attaching location to case records).

It is difficult to specify an exact sum because there were a series of contracts and contract amendments over the five-year period. Iowa DOT paid its consultant, the Center for Transportation Research and Education, for both development of the system and applications using those developments as tasks within the same contract. That makes it difficult to total the development costs now.

It is also difficult to attach a dollar figure to the development occurring within Iowa DOT once the lead developer from CTRE joined our staff. He blended his development work on GIS-SAFER with many other duties.

Project benefits: (Both Tangible And Intangible)

- **A wide array of highway safety professionals may utilize the power of GIS to analyze, summarize, and display data.**
- **Seeing is believing. Information has power, but often the visual information of maps has more power than tables or statistical information. All these forms of information are needed and are obtainable via GIS-SAFER.**
- **The system enables data integration to be achieved by Iowa.**
- **The cost of these tools and products is either free or (for GIS-SAFER) is limited to the cost of an ESRI ArcView license.**
- **There is customization for individual needs and capabilities.**
- **This system replaced the 25-year-old link-node system, which was very costly for the Iowa DOT to maintain.**
- **The Iowa DOT is positioned for easier, more economical system maintenance and future development.**
- **GIS-SAFER is another option for states' exploration of sharing analysis tools and methodologies.**

PART 2 - PROJECT DETAIL

NARRATIVE

Please describe the scope of the project and how it relates to the 6 Goals of the 'National Agenda for the improvement of highway safety information systems'.

Iowa SAFER is the culmination of a philosophy of highway safety data management which seeks to provide the highway safety community with safety data and analysis tools matched to individual needs and level of technical competency. It is the belief that workers at every level can do a better job with the right information. It is also our assumption that people who devise and execute their own queries, interacting directly with databases, are more likely to become successful problem-solvers than those who are given only printed reports. SAFER is the culmination of a five-year transition to GIS technology from start to finish—data capture to data analysis—while remaining true to that philosophy.

When traffic crash records were first automated in Iowa in the mid-1970s, a pseudo-coordinate link-node system was introduced. A number of states did this, including Alabama and Maine. By adopting a statewide location methodology early on, these states reaped numerous benefits over time. Having one location system statewide meant one analysis system would work, statewide. It is worth noting that all three of these link-node states have stable, productive, centralized crash data analysis systems that are continuing to provide information to a statewide network of constituents.

During Iowa's link-node era, there were maverick Iowa cities and towns creating their own crash databases and analysis software, but eventually the necessity to reduce costs and gain economies of scale strengthened statewide unity. The Iowa DOT's Accident Location and Analysis System (ALAS) and, years later, its Traffic and Criminal System (TraCS) for the data collection end of the business, both are conceptually rooted in Iowa's original link-node location system.

In the 1980's, ALAS was converted from a mainframe system to a PC-based system. The crash file continued to reside on the mainframe, but the bulk of analysis work was done in the PC environment—the original ALAS software was simply mined for ideas and then junked. Users were given free floppy disks with their county's crash data for 10 years and an easy software package called "PC-ALAS". Local customers loved it, for in the years preceding this change, the Iowa DOT had become a service bottleneck, lacking staff to meet customer demand for mainframe queries.

As years passed, local customers asked that PC-ALAS be placed into a GIS platform. Therefore, using various state and federal funds intended to serve local safety needs, the Iowa DOT set out to do just that. Note that this is a different genesis than the Iowa DOT's own agency-wide GIS development. From the earliest stages of design, GIS-SAFER was intended as a tool for the highway safety community and only secondarily for the Iowa DOT.

Contractual work began at the Iowa State University Center for Transportation Research and Education (CTRE) in January 1997. Initially a three-year project was established. The first

version of "GIS-ALAS" was field-tested in 30 state and local agencies with a 10-year crash data set ending with 1998 data.

To our consternation, even our most gung-ho customers were slow to try it out. It required ArcView running in the background, plus some general GIS know-how. The project was at the stage where customer usage was critical to future refinement. Without their input, little more could be done. We realized that the very novelty of it was a barrier for busy people. Our staff took up other urgent data projects, intending to get back to GIS-ALAS later on.

During this gap, GIS work went forward in other contexts. The Location Tool (smart map) for capture of coordinates was developed and implemented statewide. A MapObjects enhancement (Crash Mapping and Analysis Tools, or CMAT) to the non-GIS analysis tool was developed as a spin-off of the Location Tool. The Emergency Response Information System (ERIS) was also developed in this time interval. So, while we did not have a GIS analysis package that non-experts could use, we found ourselves with an array of other impressive applications of GIS technology.

Furthermore, in this development interval, GIS analysis of crash data continued to be performed by GIS experts at Iowa DOT and at Iowa State University, and by a few others around the state. To help get GIS output and maps into non-technical customers' hands, the Iowa Traffic Safety Data Service was set up through the Statewide Traffic Records Advisory Committee using Section 411 funding. Therefore, GIS analysis never ceased during the "gap" and continued to whet the appetite of customers.

When the GIS-ALAS development work was resumed, we had two new advantages. First, the original developer, Michael Pawlovich, had come to work for DOT from CTRE. Second, the rapid implementation of the Location Tool meant that the old analysis tools were out of date and that the time for GIS analysis "by the masses" had come. Furthermore, an analysis tool that could be used by local agencies for local TraCS databases was urgently needed—and GIS-ALAS was poised to fill that need.

Also two major paradigm shifts had occurred since the first version of GIS-ALAS was released—causing the developer, now also the Iowa DOT state safety analysis engineer, to change his system design. GIS-SAFER was born.

First, there was the recognition that many kinds of data needed for the safety business could be collected, maintained, and utilized within the same processing system. Safety analysis needed to deal with many databases simultaneously. This is not a new idea by any means. In fact, the creation of linkages between data files has been a major theme in the history of ATSIP. And for many years, we'd anticipated that GIS platforms would finally enable Iowa to reach that goal. Researchers already use GIS to analyze multiple databases. That is here and now, even for crash data analysis in Iowa. So what was the paradigm shift?

The shift was in the subtle aspects of the customization of the GIS software for widespread use, quite hidden from the user. It was a matter of designing GIS-SAFER in anticipation of future databases and of how safety professionals would want to manipulate them, instead of doing costly add-ons later.

The second shift was the recognition that analysis software can be designed to be adaptable to other states' databases and analysis needs. Again, an early investment in developer time is expected to reap dividends later. And again, this applies not to using GIS tools "out of the box" but to the effort of customization that brings these tools within the grasp of a broader user group.

Relationship to National Agenda Goals

Goal II: This project centers on bringing GIS-based safety information to the entire highway safety community of Iowa.

Goal IV: Highway safety professionals in Iowa now have access to GIS technology in a variety of ways and can utilize what is appropriate for their needs.

Goal VI: By providing customized analysis software, the Iowa DOT both empowers others and also promotes technical standards for analysis. While the customization may appear on the surface to be primarily for user-friendliness and efficiency, it performs additional functions. Since the Iowa DOT's safety analysis engineer has created the customization, it guides the user and helps prevent pitfalls that novices might encounter. When the customized queries and reports are utilized, the technical quality of output is of uniformly higher quality among users.

Describe the major process steps that you went through to do this project:

The history leading up to the first development contract has been explained in other sections. Beginning with the contract:

1. A project guidance team with state and local agency representatives was formed to review and monitor major decision points of the project. The team met periodically with the CTRE team, led by Dr. Reginald Souleyrette as principal investigator.

2. A review of potential GIS platforms was conducted. The guidance team concurred with CTRE's recommendation that ESRI's ArcView was the best choice for further development.

3. Ten years of crash data were converted into shape files for use with ArcView.

4. The lead programmer taught himself to create Avenue Scripts, the programming language of ArcView, and began to create trial customized features.

5. A 30-agency beta-test group was given the first version of the customized software. The Iowa DOT's consultant for crash analysis software training organized beta test exercises, oversaw the creation of the testing manual, and supervised the collection of test results. Agencies who completed the testing were given ownership of the ArcView license they had been given.

6. The training consultant conveyed beta test results to the lead programmer. At this point, the development gap in this particular tool commenced while other GIS tools were developed. (This is explained in more detail in other sections.)

In the chronology, it is notable that a MMUCC team formed about this time and devised a new crash report form for Iowa that was put into use in January 2001. The developer of SAFER was a key member of that team and a new employee of the Iowa DOT (following graduate school).

7. GIS-ALAS was redesigned with new objectives and renamed GIS-SAFER. The umbrella GIS was named SAFER and included ERIS and CMAT as well as GIS-SAFER.

8. Concurrently with (7), the GIS-SAFER developer continued to meet with the former MMUCC team that included key law enforcement members. These officers were at the cutting edge of law enforcement technology and gave the developer invaluable input.

9. Also concurrently with (7) and (8), the Governor's Traffic Safety Bureau provided funding for an urgent sub-project. CTRE was funded to create the software interface between the TraCS local database format and GIS-SAFER, greatly speeding up the work.

10. GIS-SAFER was demonstrated in March at the annual Iowa Governor's Traffic Safety Bureau Conference in Cedar Rapids.

11. The process of editing and examining the year 2000 data was anticipated to be lengthy. It was the first year in which link-node related data elements were eliminated and some post-processing from the roadway file was required. (That file was considered a more accurate source of specific items.) The state safety analysis engineer was busy on the MMUCC team and with developing GIS-SAFER, and he could not begin the editing process when he would have preferred to do so. As a result, the year 2000 data is only now ready to be distributed in final form to local users (after being available in preliminary form for some time).

The releases of the new software for GIS-SAFER and CMAT will coincide with that data distribution. This distribution should be occurring in May and June, 2002. Since our distribution to locals is still based on mailed CDs, it is important for us to bundle these items together for the time being. Obviously, this is awkward and has been put on our "to do" list.

Did the project successfully achieve the benefits identified earlier?

Yes __X___ a few of the benefits = too early to tell
No _____

Describe how the project actually met or did not meet the benefits:

Any safety professional in Iowa needing safety information in GIS formats has a way of obtaining it, usually at no cost. The Iowa Traffic Safety Data Service and other sources have generated a tremendous amount of output.

Iowa has succeeded in migrating entirely away from all link-node components of the crash data processing system. It has done so in ways that enable seamless analysis of both old and new data years by GIS and non-GIS analysis tools alike.

TraCS agencies are highly motivated to obtain the new GIS-SAFER so that they may analyze in-house TraCS databases with the same degree of sophistication that is available with state aggregated data. (May-June, 2002)

Users of the old link-node system, analysis tool "Access ALAS" are in keen anticipation of another SAFER component, CMAT, which enables them to dispense with the lookup and query by links and nodes and use map-based point-and-click query format. (May-June, 2002)

Submit via mail to:

Jan L. Meyers
Washington State Department of Transportation
Transportation Data Office
P. O. Box 47380
Olympia, WA 98504-7380